1:Stanford U. S-4, 5 1956 AF16 SW China
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000 exports from the province of Kweichow.[30]

241 313 433 Sikang Province, with a population a little over three million, is a comparatively undeveloped area. Its principal products, in addition to grain, are herb medicines and lumber. Sikang is considered one of the chief lumber centers in China. In the regions of the Ch'ing-i River, the Ta-tu River, the Ya-lung River, and the Sikang-Tibet plateau there are forests over 500 years old.[31] Lumber production[32] in Sikang in 1954 was reported to be 34 times that of 1950. However, since transportation facilities have not yet been fully developed, and lumber resources of Sikang Province cannot be fully utilized.

VI. WATER CONSERVATION AND IRRIGATION

312 The most renowned irrigation system in Southwest China is the Tu-chiang Yen (Tu-chiang Irrigation Works) in Szechwan Province. It was built in 250 B.C. by order of Li Ping, governor of Shu (Szechwan) during the Ch'in Dynasty. Li was an able administrator and

30. Ibid.
31. People's Daily, Peking, Oct. 21, 1954.
32. Ibid.

1:Stanford U. S-4, 5 1956 AF16 SW China
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312 and engineer who understood the value of water conservation and irrigation.[33] A large area of land under his control was flooded each year and a series of natural calamities had brought his people close to starvation. After an extensive investigation of the causes of the floods, he and his son planned the irrigation system which harnessed the rivers and dammed the flood waters so that they might be used with profit.[34] The entire system constructed over 2,000 years ago, is in service today. It can irrigate half a million acres of land in 14 hsien within the Chengtu plains region.[35] Chi Yung's Water Conservation and Irrigation in Ancient China gives an interesting account of the development of the system. Minor repairs are made each year and major repairs every five years.[36]

Many smaller irrigation projects are undertaken each year in order to extend the amount of land under cultivation, and in consequence agricultural production has

33. Chi Yung, Chung-kuo Ku-tai Ti Shui-li [Water Conservation and Irrigation in Ancient China], Shanghai, 1955, p. 27.

34. Ibid., pp. 28-29.

35. People's China, Peking, Sept. 1, 1954, No. 17, p. 18.

36. Ta-kung Daily, Hong Kong, June 24, 1955.

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312 steadily increased throughout the provinces of the Southwest Region.

VII. CONCLUSION

241 433 The Communist regime has given special attention to the intensive development of the agricultural resources of the Southwest Region. In Southwest China, the province of Szechwan plays the most important role in the production of grains and commercial crops. Since 1953, even the provinces of Yunnan and Kweichow, where the supply of foodstuffs has been generally inadequate, are asserted to have become more or less self-sufficient. Surplus grain from Szechwan is available in cases of emergency elsewhere in China, and the province is relied upon to make up the grain deficits of other regions. Southwest China also produces in abundance a number of commodities suitable for export, including tung oil, tea, silk, canned meats, wine, and fruit.

474 The movement to extend the authority of agricultural producers' co-operatives throughout the rural districts of Mainland China has accelerated since the promulgation of the "Resolution on Co-operativization" in November 1955. Since the principle of "mutual-aid" is counter to traditional Chinese practice, it will doubtlessly meet strong resistance among the peasants as soon as the cadres relax their

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scends into a valley enclosed by arid hills. The valley floor is planted with wheat at an elevation of 7,400 feet. Continuing in this valley we come to the hamlet of P'u-ch'ang-ho 普昌河 (Universal Prosperity), so named after the stream which divides it in two and is spanned by a bridge. This region and the neighborhood of P'u-p'ung was the happy hunting-ground of the bandit chief Lao Ying-hsiung 老英雄, who held sway at the time of my visit in 1928. Since then he has met the fate of most of the men who follow that dangerous profession.

From P'u-ch'ang-ho the trail once more ascends the pine-covered spurs to 7,725 feet elevation. The whole country is one vast sea of mountains. Leaving a deep valley to the left, we climb to 7,900 feet over a broad, gravelly, sandy spur, and then descend into a large valley to the hamlet of P'u-p'ung 普湖.

Tenth stage. — From P'u-p'ung to Yün-nan-i 雲南驛 is a distance of 65 li. Elevation 7,000 feet. (An *i* 驛 was a courier or dispatch station.)

From P'u-p'ung the trail climbs steeply to a flat spur at an elevation of 7,700 feet, where a lonely temple is situated dedicated to Kuan Ti (Kuan Ti Miao). The whole plateau is of sandstone and deeply eroded. Beyond the temple are a few farm-houses. The trail leads on over rolling country on the top of broad spurs of yellow sand and clay, covered with a scrub vegetation of pine, wild pears, Cornus, and a mass of Gnaphaliums. To the north are deep depressions, while the track skirts the mountain-sides near the top. The entire region is wild in the extreme, poor and unproductive. Hamlets are few, and when encountered they consist of only a few houses; cultivation being carried up the steep hill-side. Near a grove of large oaks is the hamlet of Shui-p'ang-p'u 水滂舖 (Roar of the waters), elevation 7,700 feet, on the inner slopes of the mountains, facing a depression south-west.

We continue now over a steep road to the top of another spur, elevation 7,800 feet, between scrub-oaks and Ketteleria trees. Beyond this pass is the hamlet of An-nan-kuan 安南關 (Pass of the peaceful south), a distance of 25 li from P'u-p'ung. In ancient days there used to be stationed here a *hsün-chien* 巡檢 (sub-district deputy-magistrate) who examined the travelers. This is the regular lunch-stop for caravans. From here the trail ascends to 8,000 feet along the edge of deep ravines where poplars and *Rhododendron Delavayi* grow; a splendid view is obtained of the large plain of Yün-nan-i to the west. Continuing for some li on the top of the spur, with waves upon waves of mountains to the south, we finally descend over a steep and much eroded trail, the mountains being sandstone, to this plain.

Yün-nan-i plain is about 25 li broad and over 60 li long, yet does not contain a single stream, or flowing water of any kind, being dependent throughout on wells and ponds. At times these become dry and water must be carried from great distances. Near the hamlet of Mu-p'ang-p'u 沐滂舖, at the foot of the spur at an elevation of 6,900 feet and the first hamlet encountered on the Yün-nan-i plain, are square ponds of bluish-grey water, the only supply of the village. Wheat is grown but no rice. A trek of about 20 li over the level plain brings one to the lonely and dreary hamlet of Yün-nan-i (Yün-nan post station).[1] The inns are poor and terrible, and the two temples of the village are

[1] Yün-nan-i is east of Yün-nan hsien. Near to it is the ancient village of Ku-ch'eng-ts'un 古城村; it was on that account considered the Ku Yün-nan chün-ch'eng 古雲南郡城

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stone, and the entire plateau is apparently hollow, as is the region of the lake of La-shih-pa 喇比埧. The walls of the sink-holes are covered with oaks and pines, the floors giving way in the center to funnel-like shafts.

The trail leads east over the undulating plain of yellow clay and extensive limestone outcroppings, which remind one of the lava-flows of Hawaii, but are grey in color. These outcroppings are taken possession of by deep pink *Rhododendron racemosum* bushes which, with a prostrate form of *Quercus semicarpifolia*, form regular carpets.

Straight ahead is the famous pyramidal mountain Wen-pi Shan 文笔山 (Pencil Hill), called Sä-bpi zhĕr nv-lv, or Sä-bpi a-nan Ngyu, in Na-khi, whose slopes had suffered badly during the earthquake in 1925, when the whole western face of the mountain slid down, forming a huge talus slope. The mountain is renowned in Tibet. It represents a mountain deity called Zhi-da-mung-po (gzhi-bdag-smug-po གཞི་བདག་སྨུག་པོ་). (*See*: *San-pi-zai-lung* p. 184).

Further the trail turns north-east over the same plateau (called in Na-khi, La-bpiu-k'o), at an elevation of 10,000 feet, and then descends to a little shrine called the Shan-shen Miao 山神廟 (Shrine of the mountain spirit). It continues on down to a lower plateau — again with sink-holes — the level places being under cultivation. From here the Li-chiang snow range is now visible to the north.

The crops on this plateau are dependent wholly on rain, for it is entirely waterless. The lowest part stands at 9,400 feet, and the dusty trail seems endless, but descends at last through pine forest to the plain of La-shi, in Chinese La-shih-pa 喇比埧 (also written 剌比埧). The caravan stop is at the hamlet of Sä-bpi wùa boa (also called Sä-mbi wùa-boa in the Dto-mba or Na-khi priest books). Elevation 8,700 feet.

Beyond the village a wooden bridge leads over the La-lo-k'a stream, whence the trail runs between the La-shi Ḳhū (Lake of La-shi), and the mountains and then north-east towards the pass over the spur which joins the southern end of the Li-chiang snow range with Ma-an Shan 馬鞍山 and Wen-pi Shan 文笔山. The pass is called in Na-khi, La-shi gkaw-gkū, is 8,750 feet above sea level, and 20 li from La-shih-pa. From its foot it is eight li across the plain to the town of Li-chiang.

As the region to the south of Li-chiang is inhabited mainly by the Min-chia tribe it may not be out of place here to say a few words about these neighbors of the Mo-so, or Na-khi.

THE MIN-CHIA TRIBE (PLATES 7, 8)

The Min-chia 民家, called Lä-bbu by the Na-khi and considered by them as their second elder brother — the first being the Tibetan, whom they call Gv-dzu — are known to the Chinese, especially in their literature, as Pai-jen 白人 (White people). In their own language they call themselves P'ĕr-tsu, colloquially they speak of themselves as P'ĕr-nv-ts'a. They are scattered over much of Yün-nan and formed once the principal population of the ancient Nan-chao Kingdom. Unlike the Na-khi they have no written language. They are much intermingled with the tribes which live in the neighboring region of

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173 At that time Lung-yu-na 龍佑那, descendant of the 15th generation of Jen-kuo of the Pai-tzu Kingdom 白子國, was enabled to pacify and settle his people. Chu-ko Liang appointed him as their chief, gave him back his own land, conferred on him the surname Chang 張, and changed the name of Pai-tzu Kingdom to Chien-ning Kingdom 建寧國. A walled city was built and called the Chien-ning ch'eng 建寧城,[18] and an iron pillar and stone monument were erected in memory of these military exploits.

During the five pre-T'ang dynasties. — In the seventh year of the period T'ai-shih 泰始 of Chin Wu Ti 武帝 (271), there was established Ning chou 寧州,[19] to whose administrative control was allotted a part of the district of I chou which still existed and had its own administration.

In the fifth year of T'ai-k'ang of the same emperor (284) Ning chou was abolished and the district placed under I chou.

In the second year of T'ai-an 太安 of Emperor Hui Ti 惠帝 (303) Ning chou was re-established.

In the second year of Yung-chia 永嘉 of Emperor Huai Ti 懷帝 (308) I chou was renamed Chin-ning 晉寧, which name was retained by the Sung 宋 (420–478), Ch'i 齊 (479–501), Liang 梁 (502–556) and Ch'en dynasties 陳紀 (557–589).

In the 15th year of K'ai-huang 開皇 (595) of the Sui 隋 dynasty, there was established the Tsung-kuan fu 總管府 (Civil government of I chou), which controlled Nan-ning chou 南寧州 from a distance without an official taking up his residence in that place.

Under the T'ang dynasty. — In the seventh year of the period Wu-te 武德 of T'ang Kao Tsu 高祖 (624), the Emperor ordered Wei Jen-shou 韋仁壽[20] to investigate the affairs of Nan-ning chou. He led 500 soldiers to the Hsi-erh Ho 西洱河,[21] to take charge and govern. He established eight chou and seven-

[18] Chien-ning ch'eng is the present village of Mi-tu 彌渡, 30 li south of Hung-ngai, two and a half stages south-east of Ta-li. In Mi-tu there is a temple called T'ieh-chu Kung 鐵柱宮 (Iron-pillar Temple), in which an iron column is preserved to this day. The pillar was cast by the Chien-ning King, Chang Lo-chin-ch'ü 張樂進求. A second one (the first having perished) was cast by Meng Shih-lung 蒙世隆, who called it T'ien-tsun chu 天尊柱 (Celestial venerable column).

[19] In the Han dynasty it was the land of I chou, and in the Minor Han it was the Hsing-ku Chün 興古郡, extending north-east of the Lake of K'un-ming (Yün-nan fu). Ning chou during the Chin dynasty extended south of the Yün-nan fu Lake and adjoined A-mi chou 阿迷州, the present K'ai-yüan 開遠. Later, during the Ming dynasty, it belonged to Lin-an fu 臨安府, the Chien-shui hsien 建水縣 of to-day.

[20] According to the *Chiu T'ang Shu* (Old T'ang History), he was a native of Wan-nien 萬年 of Yung chou 雍州. On account of his ability he was sent to examine the military governor of Nan-ning chou; he administered the affairs of state from Yüeh-sui. He was ordered once a year to this district to encourage and comfort the people.

133 312 [21] The Hsi-erh Ho has its source 50 li south-west of Ho-ch'ing, on the mountain Hei-ni-shao Shan 黑泥哨山. This mountain is densely forested and a favorite haunt of robbers. It flows south-west and receives several affluents; thence flows south by Kuan-yin Shan 觀音山 and is there called the Kuan-yin Ho, also the Mi-tz'u Ho 彌茨河. It receives an affluent from Erh-yüan 洱源 called the Lang-k'ung Ho 浪穹河, which has its source in the Pa-ku Shan 罷谷山. The main branch of the Hsi-erh Ho comes, however, from the south-west of Ho-ch'ing. It flows into the Erh Hai 洱海 (Ta-li Lake) at Teng-ch'uan 鄧川. The dikes

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teen hsien. The Li-chiang Records state that he established seven chou and fifteen hsien.

In the 23rd year of the period Cheng-kuan 貞觀 (649) Chang Lo-chin-ch'iu 張樂進求 (*see* p. 9) abdicated in favor of the Meng family. The Meng family were originally of the Ai-lao barbarians, whose king was called Chiu-lung 九隆. A man by name Hsi-nu-lo 細奴邏, descendant of Chiu-lung (he was a descendant of the 36th generation of Meng-chü-tu 蒙苴篤, and fifth of Ti-meng-chü 低蒙苴 [*see* p. 9] who ruled from 649–764) was one day ploughing fields in the Wei Mountains 巍山.[22] He had often been noticed by others as possessing strange and lucky signs. Chang Lo-chin-ch'iu, descendant of the 17th generation of King Lung-yu-na 龍佑那 of the Pai-tzu Kuo 白子國, abdicated in favor of Hsi-nu-lo, who was then created Ch'i Wang 奇王 Mysterious King and called his kingdom Ta Meng 大蒙 (Great Meng Kingdom).[23]

The *Nan-chao Yeh-shih* states that Hsi-nu-lo called himself Ch'i-chia Wang 奇嘉王 (the Mysterious and admirable King).

At the close of the Pai Kuo 白國 (White Kingdom) there were six *ch'ü-shuai* 渠帥 (leaders), who called themselves Liu chao 六詔 (Six kings), *chao* meaning king. They were all the descendants of Chiu-lung, founder of Ai-lao Kuo. Hsi-nu-lo, who lived in Meng-shih ch'uan 蒙氏川 (the present Meng-hua, one and a half stages south of Ta-li), called his realm the Meng-she chao 蒙舍詔. The others were the Yüeh-hsi chao 越析詔 (Yüeh-hsi is the present Li-chiang hsien); the Lang-k'ung chao 浪穹詔 (Lang-ch'iung [but read *k'ung* in Yünnan], the present Erh-yüan, one and a half stages north of Ta-li); the Teng-t'an chao 鄧賧詔 (Teng-t'an, the present Teng-ch'uan hsien 鄧川縣, 90 li north of Ta-li); the Shih-lang chao 施浪詔 (the present [banks] of the Mi-tz'u Ho 濔茨河, the former Lang-k'ung in the district of Erh-yüan); and the Meng-sui chao 蒙巂詔 (the present Chien-ch'ang 建昌 [Hsi-ch'ang 西昌] in Ssu-ch'uan and north of K'un-ming).

Only the Meng-she chao 蒙舍詔, which lay to the south of the other five kingdoms, was therefore called the Nan-chao (Southern Kingdom).

In the 26th year of the period K'ai-yüan 開元 of T'ang Hsüan Tsung 玄宗 (738), Wang Yü 王昱, the Chieh-tu-shih 節度使 (Imperial commissioner) of Chien-nan 劍南,[24] received bribes from P'i-lo-ko 皮羅閣[25] requesting that he

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through which the stream flows across the Teng-ch'uan plain were begun during the reign of Ming Cheng-t'ung (1436–1449). They burst ten times between 1691–1775.

[22] The present-day Wei-pao Shan 巍寶山, situated 20 li south of Meng-hua 蒙化 (one stage south of Hsia-kuan 下關).

[23] The Ta-meng Kuo (Nan-chao Kingdom) existed from 649–902. There were 13 generations of rulers over a period of 255 years.

[24] The *Nan-chao Yeh-shih* says Chien-ch'uan 劍川; Chien-nan is correct. It was the ancient State of Shu and during the T'ang dynasty was called Chien-nan. The Chien-nan Chieh-tu-shih resided in Ch'eng-tu fu 成都府 and controlled 39,000 troops and 2,000 cavalry. In the west he attacked the T'u-fan and in the south he governed the Man (savages).

[25] P'i-lo-ko was the great-grandson of Hsi-nu-lo, founder of the Nan-chao Kingdom. He was the son of Lo-sheng-yen 邏盛炎 and was 31 years of age when he ascended the throne of Meng-she chao in the 16th year of K'ai-yüan (728). The *Nan-chao Yeh-shih* states that the above mentioned event, that is, the combining of the five other kingdoms, or *chao*, took

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T'ang dynasty (889–904). Annually in the first moon the peasants of the sub-districts of Ta-yen li, Pai-ma li, La-sha li and La-p'iao li repaired to that temple to worship the spirits of the mountains, rivers, earth and grain.

Hsiang Shan 象山 (Elephant Mountain), called in Na-khi, Gyi-wùa Ngyu, named after the village of Gyi-wua situated to the north of the Lung-wang Miao 龍王廟 (Dragon king Temple), is three li north of the city, and resembles a reclining elephant. It is therefore also called the Hsiang-mien Shan 象眠山 (Sleeping elephant Mountain); the city is situated at its southern point. There are several springs called Hsiang ch'üan 象泉 (Elephant springs) at its foot which are the source of the Yü Ho 玉河 (Jade Stream) The Ngu-lu gyi of the Na-khi; these springs are five li north-west of Li-chiang and are also the source of the Yang-kung Chiang 漾工江 of Ho-ch'ing.

Chih Shan 芝山 is called in Na-khi, Khyu-t'o-llü Ngyu, from the monastery Khyu-t'o-llü which is situated on its slope (PLATE 64). Its ancient name was Chieh-t'o-lin 解脫林. This mountain is to the south of the snow range and is part of its southern spur. One of its summits is called Tzu-kai-feng 紫蓋峯, and another Chao-yang-kang 朝陽岡, while a certain cliff has the name of Shih-tzu ngai 獅子巖 (Lion cliff). The easiest approach to the mountain is from Pai-sha (Boa-shi), south-west of which it is situated. It lies between the village of Shu-ho 東河 and Pai-sha and adjoins the mountain on which Huang-shan shao 黃山哨 is located. At its foot nestles the hamlet of A-chung-wùa. In the possession of the Mu family is a work on this mountain called *Chih-shan yün-kuo-chi* 芝山雲過集, written in 1628 by the most famous of all the Na-khi chiefs, Mu Sheng-pai 木生白. A copy of this work is in my library.

Among the maze of hills which compose Chih Shan is the lamasery Fu-kuo Ssu 福國寺,[4] which possesses an abbot's reception hall. To the left of the lamasery is a spring called Pai-lu ch'üan 白鹿泉 (White deer spring) and a pond called Han-yüeh Hu 涵月湖 (Submerged moon pond), also a cliff called Pei-tou ngai 北斗崖 (Dipper cliff) and a hill called Tan-feng-luan 丹鳳巒 (Phœnix peak). To the right there is a mountain rim called Tan-hsia-wu 丹霞塢 (Red cloud embankment), a hill called Yü-yin-feng 玉印峯 (Jade seal hill), and a pond called Lao-t'an 老潭 (Old pool). In front of the lamasery there is a mountain called Ts'ui-po Shan 翠柏山 (Green cypress Mountain). All this is engraved on a memorial stone, written by the Ho-ch'ing magistrate, Chang Hsüeh-mou 張學懋.[5]

Ma-tso-shu Shan 馬左墅山 is 30 li south of Li-chiang. The Na-khi pasture their cattle on this mountain.

San-pi-wai-lung Shan 珊碧外龍山 is the famous Wen-pi Shan 文筆山, a triangular peak 15 li west of Li-chiang. It is the Sä-bpi zhĕr nv-lv of the Na-

P'u-te t'an has been abandoned as a place of worship, as each village has its own *d'a*. It is possible that the members of the P'u-dtu clan are the descendants of the original inhabitants of the region, namely the P'u tribe, who adopted the Na-khi custom of propitiating Heaven.

[4] The name was given to the lamasery by the Ming Emperor Hsi Tsung (1621–1627).

[5] This memorial stone is built into the wall immediately beyond the main entrance to the temple. It is dated the seventh year of Ming T'ien-ch'i (1627) and gives the name of every hill, cliff and grotto.

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khi. The mountain is well known to the Tibetans, who call it Zhi-dag mug-po written gzhi-bdag-smug-po [in Na-khi Shi-zhi muan-bbu]; (in the Tibetan classic of the mountain god Dra-lha [dgra-lha] the mountain is called Jang-ri-mug-po [ljang-ri-smug-po ལྗང་རི་སྨུག་པོ་], *i.e.*, the purple mountain of Jang = Mo-so); another Na-khi name for it is Sä-bpi a-na Ngyu. On this mountain grows a bamboo from which the Na-khi (used to) cut their arrows. On its slopes there was once a temple called Ling-shou Ssu 靈壽寺, built by the Mu family during the Ming dynasty. In the fourth year of Ch'ien-lung (1739), a lama, known as the Ssu-pao la-ma 四寶喇嘛, came with a retinue to pay his respects to the prefect of Li-chiang, called Kuan Hsüeh-hsüan 管學宣. He induced him to subscribe funds and to have the priest, Ming Chü 明具, and others solicit funds for the building of the Wen-feng Yüan 文峯院 lamasery, or Wen-feng Wan as it is called in Yün-nan, situated on the slopes of the mountain.

Meng-hsi Shan 蒙喜山 is 50 li north-west of Li-chiang; at its foot was the A-khi (A-hsi 阿喜) guard-house at the A-khi ferry across the Yangtze. The mountain is terraced and is several ten li long, resembling a screen.

A-na Shan 阿那山 [6] is 270 li north of Li-chiang, on the southern border of the ancient Pao-shan chou 寶山州. This is the still more ancient Hsieh-lung 邪龍, so known during the Han dyansty (206 B.C.–A.D. 24), and in the present district of La-pao 剌寶 (La-bpu). On this mountain was an ancient stockaded village called A-na-ho 阿那和.

Lao-chün Shan 老君山 [7] is 250 li south-west of Li-chiang and rises high into the clouds; its height is 14,100 feet. It is north-west of the town of Chien-ch'uan, and is reckoned as the father of all the mountains of Yün-nan. A powerful spring issues from it. It is believed that Lao-tzu 老子 once prepared the magic drug of immortality on this mountain — hence the name.

Wang-chiang Shan 望江山 is 80 li south-west of Li-chiang. The Shih-ku 石鼓 Ch'ung-chiang Ho 衝江河 [8] flows between Lao-chün Shan and Wang-chiang Shan, the latter being south of Shih-ku.

[6] There is also a mountain, or rather spur, west of the village of Dü-gkv (at the head of the Li-chiang plain), which is called 'A-na-gkv.

[7] This mountain is also called Lo-chün Shan 羅均山 and La-chün Shan 剌均山. The *Yün-nan T'ung-chih*, ch. 22, fol. 5b, quotes these as synonyms for Lao-chün Shan. It also states that Lo-chün Shan 羅均山 is 20 li north-west of the old Li-an chou district. Its ancient name is La-kou Shan 剌鉤山. The second character is apparently a misprint and should be *chün* 鈞. Five deep ponds are on its summit, and the natives pasture their yak on the mountain, hence it is also called Mu-niu Shan 牧牛山. It lies 250 li south-west of Li-chiang. On Lao-chün Shan is a *ling-ch'üan* 靈泉 (mysterious spring); as the water flows down the mountain it is called Lao-chün Ho 老君河, another name for it being Shih-lai Chiang 石棠江. From the eastern slopes issues the source of the Chien Hu 劍湖 (Chien-ch'uan Lake) — this being merely a tributary of the Yang-pi Chiang. The *Yün-nan T'ung-chih* states that both waters flow into the Chien-ch'uan Lake. This is, of course, not so for they flow into the Yang-pi, and the Chien-ch'uan Lake has an outlet into the Yang-pi south of Chien-ch'uan.

[8] It is also written Ch'ung Chiang 冲江. The stretch from where it flows west to east is called La-pa Ho 拉巴河 (La-ba gyi in Na-khi), as one branch of it has its source in the La-ba Ngyu (La-ba-gko Mountains), called in Chinese La-pa Shan 拉巴山, west of Shih-ku. In Na-khi the mountain is called La-ba Ngyu after the village of La-ba, the Chinese Shih-ku.

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rising to over 20,000 feet into an azure sky, while Ha-ba ndshĕr nv-lv rears its snowy head high over the crags and pinnacles forming the last of the spur to the west, at the foot of which the Yangtze roars some 10,000 feet or more below, ever carving a deeper and deeper gorge. Range upon range is visible, as well as the Yangtze in its trench at Ta-ku after it emerges from the gorge between Ha-ba ndshĕr nv-lv and the crags of 'A-ts'an-gko.

From 15,500 feet on, the grade is gentle and the going is good. We continue on the top of the wide spur leading to the broad peak, over thousands of tiny, loose, sharp limestone rocks. The entire surface of the hard limestone has been split into myriads of fragments by the action of the ice. The wall of rock which forms the eastern part of the gorge is cleaved several feet deep into a forest of columns as if the entire surface had been chopped up with a giant's axe. From the summit down to 17,000 feet the broad spur is buried beneath a massive glacier, the ice lying in folds like the train of a wedding garment (PLATE 87). The rocks here change in shape, resembling angular sticks several feet in length, and only about two inches in width. They lie about parallel to each other, having been split by the action of severe frosts and ice. Quartz is not uncommon here, also iron-bearing rock and pure white marble. The ascent to the summit of this mountain can easily be accomplished, one needs only follow the western outer edge or rampart which hems in the glacier, and which is usually free of snow. The only obstacles are the terrific gales which blow over these mountains, whirling the snow in huge columns like smoke into the air. If one wishes to ascend Gyi-nà nv-lv, camp should be pitched in the gorge west of it, on a broad shelf or terrace, suitable for a camp, a little below 16,000 feet. At 14,500 feet and even higher we found *Lerwa Lerwa major* on the rocky, barren waste and also several snow chickens, *Tetragallus tibetanus henrici*, neither hitherto recorded from Yün-nan.

6. THE REGION BETWEEN TA-KU (NDA-GV) AND GKO-NDZA-GKV

Ta-ku and the many small villages belonging to it are collectively called Ta-chü li 大具里. Ta-ku itself is situated on a fan-shaped plain mainly composed of conglomerate. To the west the plain is bordered by the Gyi-nà nv-lv and the Chien-t'ai Ho 漸台河. The Yangtze emerges here from the terrific gorge which it has cut for itself through the Li-chiang snow range, and flows east for a short distance through the conglomerate plain and then north at the foot of a mighty range — the Dzu-k'u nv-lv as it is called by the Na-khi of Ha-ba and Bbĕr-ddĕr. The plain through which the Yangtze flows, 600 feet below the main village of Ta-ku, drops in terraces towards the river. It is entirely inhabited by Na-khi, except for a few Chinese settlers. The climate is warm enough for two crops to mature in one year. Wheat, panicled millet (*shu* 黍), cotton, rice and maize are grown. Out of the millet stalks they make sugar known as Sha-t'ang 砂糖. *Cannabis sativa*, the *ma* 麻 (hemp plant) which the Na-khi call *ssaw*, is much cultivated, especially the female plant which gives better fibre and which they call *ssaw-mă*.

Ta-ku is 140 li north of Li-chiang. To the west of the village is a large spring called Lung-ch'üan 龍泉 (Dragon spring); in the days of a native official, its water was conveyed in irrigation ditches to the higher fields. Near the

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race becomes higher in one place, causing the water to desert its old terrace and to flow over the hill in another direction, to build anew. The whole hill is therefore covered with ancient basins and terraces, some much broken and covered with vegetation and of a dark grey, resembling the hide of an elephant. Some of the circular basins are fully 20 feet broad, yet are only a foot or less deep, growing ever taller like stalagmites, which they really are, with the only difference that instead of shedding all the water, they retain a quantity in a shallow, broad basin. (PLATES 136, 137, 138.)

One part of the terrace is especially high, forming a large, bulging promontory resembling the fat-bellied god of the Chinese, Mi-le-fo 彌勒佛, whose name it bears (PLATE 139). Below the bulge is a natural slit in the limestone which communicates with the interior. Here barren women come to pray for children, burning incense before the opening.

In the shallow sinter basins, as well as in the furrows and corrugations of the terraces over which the water flows, there are to be found millions of pisolites or oölites, resembling the roe of fish. These are formed around minute algæ which are the nuclei of the pisolites. They are not exactly round, but somewhat oblong and flattened and never thicker than the depth of the water which flows over them. They differ notably from pisolites known from similar sinter basins and terraces, as those of Madagascar and the Yellowstone of America. Instead of being composed of concentric rings, they are dichotomously branched. They are constantly rolled back and forth by the flowing water; the basins are full of them, though they never grow larger than a pea.[12]

The natives and their sorcerers look upon this terrace as sacred and as being the property of the Llü-mun, the equivalent of the Chinese dragon kings and the Tibetan Lu (serpent spirits; written kLu). *K'o-byu* offerings adorn the spring (PLATE 135), as also paper streamers, saplings, etc. Under the trees is a stone altar on which the Dto-mba (priests) burn pine branches and incense, while they chant incantations to propitiate the Llü-mun. They have a special ceremony called *Ssu-gv*, during which many books are chanted and many objects offered to propitiate the serpent spirits. The books of this ceremony, as well as those belonging to numerous other ceremonies performed by the Na-khi, I have translated and these will form two separate volumes.

The spring and terraces have no connection with the deep ravine and valley which encircle this hill; the water is forced up to the surface from hundreds of feet below. It forms the water-supply of most of the villages of Bbĕr-ddĕr. Goitre is very prevalent, but the inhabitants should never suffer from indigestion. The water is conveyed to the villages first in a ditch and then in wooden flumes which, after having been in use for a certain time, have a most curious appearance. The ditches are encrusted with lime and the flumes have become so filled with it that the boards merely serve as support for the limestone which has been built up above the edge and bulges over the boards. The water thus flows in a limestone trough several inches above the original flume. At Gu-dù the water empties from the flume to the ground. Here the mouths of the hollowed out logs which serve as troughs look as if they were covered with icicles. The main stream of water has formed a stalactite, while from the ground

[12] DR. HOFFET, of the Geological Service of Indo-China, kindly analysed these pisolites for me.

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a stalagmite has risen, the two meeting and acting as a bridge for the water.

Back of the village of Gu-dù is a large enclosure surrounded by beautiful oaks; this is the great *muan-bpö d'a* (place of worship) where the people of Bbĕr-ddĕr propitiate Heaven.

The hamlets are dirty, as are the inhabitants. The foundations of the houses are built of rock with a superstructure of logs and mud bricks. Others, again, are made entirely of logs, like Swiss chalets. They are low and their roofs of boards are weighted down with rocks (PLATE 132). The women are very shy and flee like deer at one's approach. They wear a much-pleated skirt of hemp cloth, similar to the women of Mba-yi-wùa and those of the Miao tribe.

The sacred grotto Shi-lo ne-k'o. — Bbĕr-ddĕr is a famous place of pilgrimage, for it is the wish of every Dto-mba, or Na-khĭ sorcerer (perhaps better called priest), to visit Bbĕr-ddĕr once in his life and make a pilgrimage to Shi-lo ne-k'o, a cave in the mountains hemming in Bbĕr-ddĕr to the east. This cave is also, but less commonly, spoken of as Shi-lo 'a-k'o. There Dto-mba Shi-lo, founder of the Na-khi religion (Shamanism), was said to have lived, and from there he taught the people and spread his creed. Dto-mba Shi-lo is none other than sTon-pa gShen-rabs (pronounced Tön-pa Shen-rab), founder of the ancient pre-Buddhistic Bön religion of Tibet, often also spoken of as Tön-pa Shen-rab-mi-bo སྟོན་པ་གཤེན་རབ་མི་བོ , the word Tön-pa (Na-khi, Dto-mba) meaning teacher. The Na-khi have no *r* nor do they pronounce clearly a final consonant unless it be a nasal one. They therefore call him Shi-lo or Shü-lo instead of Shen-rab.[13]

Tön-pa Shenrab himself is, however, not meant, but, as the Dto-mbas say, one of his later incarnations who dwelled in that cave. No date is given and it is impossible to find out when he lived there. It is, however, a place of pilgrimage for the Dto-mbas, but now very difficult of access on account of the absence of a ferry over the Yangtze.

Bbĕr-ddĕr is in itself not a sacred place, but it is a place of pilgrimage because of its sacred spring, Bbĕr-p'ĕr-dtĕr, and the sacred cave. Handel-Mazzetti denies that Bbĕr-ddĕr is a sacred place of the Mo-so and relies also on the negative statement of the Dutch missionary Kok, who at the time of his visit was resident of the Pentecostal Mission at Li-chiang.

To reach the cave it is necessary to cross the stream Bbĕr-p'ĕr gyi and climb the high slopes of old limestone, forested with pine and oaks. At 9,600 feet elevation the cave is reached. It is, however, more of a grotto than a cave. To enter it one has to climb into a chimney-like hole, and it is there that the first Dto-mba was said to have dwelled. There are two such chimney-like chutes separated by a fluted limestone wall, in front of which is an incense burner and a pot for holding water, (probably to perform *Ch'ou-ch'ĕr* purification with water). To the left, below the main entrance, is a stone altar for burning oak and pine branches as offerings (PLATE 140). The Dto-mbas believe that a rock pried loose from the actual wall of the cave and taken home, will make

[13] *See* J. F. ROCK, The Birth and Origin of Dto-mba Shi-lo in *Artibus Asiæ* Vol. VII, 1938, pp. 5–85, and *BEFE-O*, T. XXXVII; 1937, 1, pp. 1–39.

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[312] The village people are dependent for their water supply on a stagnant pool immediately beside the trail, whose water is of a deep yellowish-red color.

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Beyond the village the path divides, the right branch leading to Aw-khi (A-hsi 阿喜) and the left to Shih-ku. The whole country takes on the aspect of an undulating plateau similar to that of Lo-shui-tung on the Kuan-shang 關上 and La-shih-pa road. The sink-holes are crater-like, and so numerous that their rims meet. The soil is a brilliant red and cultivation is continued up to the steeply sloping walls of the holes, buckwheat being the main crop. Na-khi are the sole cultivators.

The upper edge of the plateau drops steeply to an undulating, much-furrowed valley floor. Immediately below flows the Yangtze, making a narrow bend, where a ferry plies to the village of Ba-lo on the west bank of the river. The trail descends now into the Yangtze valley at a fair grade over the otherwise steep slope, till we reach the valley floor and the river bank. Looking west we behold a peculiar triangular peak at the foot of which Shih-ku (Rock drum) village is situated. There is some pine forest on the broad valley floor, though a good deal of it is under cultivation. So much has the soil been disturbed and denuded of its trees, that the whole valley floor is eroded into a maze of small canyons. Sharp limestone boulders washed out from their embeddiments dot the ground. The trail is in many places obliterated and one is forced to cross these miniature canyons over narrow ridges. In places the packed, hard trail is a mere shell over an abyss washed out beneath. The soil is a dark-red loam in which are deeply embedded black limestone boulders of fantastic shapes. On this furrowed, hilly floor the La-shih-pa road joins the one from Dto-k'ö. The trail descends steeply to a ravine called Leng-shui kou 冷水溝 (Cold water ravine), which debouches into the Yangtze 57 li from Li-chiang, and 20 li from Shih-ku. In the ravine is situated the hamlet of Leng-shui-kou, the Gyi-t'khi-lo of the Na-khi. A path leads down-stream to the village of A-khi (Aw-khi), where there is a lovely Lung-wang Miao (Dragon king Temple).

Our way leads upstream towards the curious-looking peak behind Shih-ku. This mountain is called Wang-chiang Shan 望江山 and is 80 li distant from Li-chiang.

When looking up stream near Leng-shui-kou where the Yangtze is about 600 yards wide, one would be convinced that the Yangtze issues from the valley behind Shih-ku and Wang-chiang Shan. Only close to Shih-ku is the sharp bend of the river visible.

At the foot of the Shih-ku spur the Ch'ung-chiang Ho 衝江河[5] [Stream which rushes on to the river (Yangtze)] debouches into the Yangtze.

The Na-khi call it La-ba gyi and La-ba pa-tzu gyi (Chinese, La-pa Chiang 剌巴江), for its source is in a mountain called La-ba Ngyu; elevation 14,500 feet. Shih-ku itself is called La-pa 剌巴[6] (La-ba in Na-khi), and Do-ngà-rong

[5] In the Li-chiang records given as Ch'ung Chiang 冲江, or Ch'ung-chiang Hsiao-ho 冲江小河 (Small stream).

[6] The *Tien-hsi* relates in Vol. 4, fol. 1, that "the Great Yü 大禹 was born in the land of the western Ch'iang 西羌, called Shih-niu 石紐. This place was in Hsi-ch'uan 西川, that is in western Ssu-ch'uan in the state of Shu 蜀. Shih-niu is to-day the Shih-ku of Li-chiang." It is possible that the ancient name of Shih-ku was Shih-niu and because Li-chiang be-

1 [The Na-khi village of Gqö-mbo -- Analyst]

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the Dang or A-dang lung-pa (Chü-k'o-ti Chiang). Instead of following the stream a rocky trail leads to a pass on the spur, and we descend to what is left of or originally was Liu-t'ung-chiang 溜筒江 (MAJ. D., Liu-t'ou-chiang 溜頭江; Ting's New Chinese Atlas gives the name Lan-ts'ang-chiang = Mekong instead, this is an error) situated on the east bank of the Mekong at an elevation of 7,800 feet. Liu-t'ung-chiang refers to the rope-bridge which spans the Mekong here; the village, if such it can be called, consisted of one single mud-brick house in ruins, but inhabited by a poor family, apparently squatters. Opposite on the west bank of the Mekong is the Tibetan hamlet of Ma-pa-ting 麻巴定 (written Mag-pa-sdeng in Tibetan).[20] The rope bridge here spanning the Mekong is about 100 feet above it, the river flowing between steep rock walls and is about seventy yards wide. The only water available is the muddy water of the Mekong. Women go down with huge wooden cylinders to fetch it; to prevent the water from splashing they float a lot of dead twigs on it, in lieu of green leaves or leafy twigs as is usual.

The wind howls furiously in this arid gorge, filling the air with dust. It is one of the dreariest regions, dry, forsaken, and forlorn, a veritable desert.

5. YAR-KHA-LO (YA-K'A-LO 雅卡洛)

A trail continues along the gorges of the Mekong to Yar-kha-lo (Ya-k'a-lo), a distance of five days from Liu-t'ung-chiang. The mountains which hem in the Mekong are steep and the trail is here and there obliterated by land-slides of loose shale. It often leads to a height of 10,000 feet or even more, crossing bare spurs between which lateral streams descend from the snowy heights. In these lateral valleys are situated Tibetan hamlets, where barley and wheat are cultivated, with fruit trees such as pears, peaches, and walnuts, on the margins of the fields.

On the west bank of the Mekong are about as many villages as on the east bank. North of Liu-t'ung-chiang beyond the village of Ma-pa-ting there are the following in the order named from south to north: Ssu-ts'un 司村, Jung-ma 容馬 and Me-re-shü (Mei-li-shu). South of Ssu-ts'un are the hamlets of Kua-lo 瓜洛 and Hu-li 呼里. On the east bank Chiang-p'u 江舖, La-p'u 腊舖, Pa-me or Pa-mei 巴美 (MAJ. D., Pamien) and Pa-yung-kuo 壩永鍋 (MAJ. D., Pa-yung-ko) and then Yar-kha-lo. Pa-yung-kuo is at an elevation of 11,500 feet.

Yar-kha-lo (Yar-kha-logs) is a town of about 100 houses, and is situated at 9,500 feet elevation (latitude 29° 2′ 30″). Here are important salt wells situated on the banks of the Mekong between giant blocks of granite; they supply all the villages of this region with salt. The valley slopes are composed of weathered sandstone, while about 300 feet above the river are beds of rubble which are apparently river terraces. A Catholic mission station has been established for many years in the town. Since the Tibetan wars in 1930–1931 Ya-k'a-lo has been annexed by the Tibetans, and is now reckoned to Tibet proper instead of Ssu-ch'uan. The Yün-nan — Tibet and former Ssu-ch'uan border is only a short distance beyond Pa-yung-kuo.

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CHAPTER IV

WESTERN AND NORTH-WESTERN YUNG-NING

1 AGRICULTURE, ACCESS AND INHABITANTS

S ST 311 [161] ST [24] [312]

Yung-ning 永寧

The most important part of Yung-ning from an agricultural standpoint, is of course its plain (PLATE 220), which to-day supports 300 families, although 1,000 families could subsist there if rice were cultivated, and all arable land were utilized. Only one half of the plain is now under cultivation, and rice is prohibited from being grown for political reasons. Maize, barley, buckwheat and round peas are the main crops. The plain has a plentiful water supply, as the Hli gyi or K'ai-chi Ho 開基河 [also called Lo-chi Ho 勒吉河 pronounced Le-chi Ho in Yung-ning] winds through it, receiving several affluents in its course over the plain. The latter is at an elevation of 9,500 feet, is perfectly flat, and extends east to the foot of Lion Mountain (Seng-ge ga-mu). In the remote past the Yung-ning plain was undoubtedly a lake, similar to the Lu-ku Lake, which lies 100 feet higher. The plain is surrounded by mountains with many valleys debouching into it; the only outlet is the valley which leads into the Ch'ien-so country in Ssu-ch'uan. The eastern and north-eastern end of the plain is still marshy.

The next place of importance is the long Tsui-yi valley called Wa-erh-lo 挖耳羅 in Chinese, which extends south of Wua-ha Shan, west into the Yangtze. This is a very fertile valley and rice is planted in the middle upper half; the lower part is a dry, arid canyon with steep walls; the head of the valley is wooded.

To the west of Yung-ning is another long valley called Luë-dzu law-k'aw, which also extends into the Yangtze, with another valley joining it called Hĕr-dü, the Har-lĕr-dü of the Na-khi. These valleys unite a short distance before debouching west into the Yangtze, south of San-chiang-k'ou 三江口. The remaining arable land is along the Yangtze, especially at Pu-chio 卜脚 or Law-k'a-khi-llü [also called P'u-dyü]; then along the Zho Chhu on the Hsi-k'ang border in the west of Yung-ning, and at Pa-erh-ch'iao 壩耳橋, south of Yung-ning; and finally the few fields along the shore of the Lu-ku Hu or Yung-ning Lake.

The rest of the country is exceedingly mountainous. The highest peaks are on Wua-ha Shan, which is the northern part of the Yao Shan to the east of Yung-ning. These reach 15,500 feet or more in height.

S ST 131

Access. — The main approaches to Yung-ning from the south are from Yung-pei, north via Lang-ch'ü chou, the present Ning-lang 寧浪; then from Li-chiang via the Yangtze at either T'o-lä-tsu or Chiang-wai 江外, up the Tsui-yi valley opposite Chiang-wai which is the shortest route. The northern route is via Feng-k'o 俸可 or Shang-feng-k'o 上俸可.

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Tsui-yi. The glen is short but steep and is called She-lü-lü-t'o, meaning "Iron nuggets steep place," from the fact that iron was once mined here. The elevation of this part of the valley is 9,600 feet. A short distance below the pass, Pa-erh-shao 壩耳勺 [also called Pa-erh-ch'iao], is visible. The little village is situated on a very fertile plain, but has been almost abandoned because of Lo-lo depredations. Beyond the spur south of Pa-erh-shao, and still belonging to Yung-ning, is the hamlet of Pai-chio-pa 白角壩 in Lang-ch'ü T'u-ssu territory. The distance from A-ngu valley to She-lü-lü-t'o is 22.5 li.

The trail descends the narrow glen and leads out into the great valley of Tsui-yi called in Chinese Wa-erh-lo 挖耳羅, where a magnificent view awaits the traveler; the entire Li-chiang snow range, like a huge sleeping dragon, appears on the distant horizon, but the third peak, Ha-ba ndshĕr nv-lv, is hidden by other ranges. Arrived in Tsui-yi valley the trail continues west between fields, in ditches and over rocks thrown there by the farmers. Most of the settlers in the upper part of this valley are sons of Han (Chinese). Any trail passing between fields is always the recipient of all the rocks the peasants can find in their fields. It also serves as irrigation ditch, the water from one terraced field being allowed to overflow on to the trail, to irrigate a field lower down. When the water is not wanted lower down the path becomes the bed of a brook. The valley floor is terraced; in the southern valley wall is a broad amphitheater traversed by three streams which flow into the Tsui-yi Stream. Here are several hamlets collectively called Lö-bü. Beyond Lö-bü the valley narrows and the trail leads along the grass-covered hill-side (*Heteropogon contortus*), with here and there a hamlet of a few houses. Next to Hli-dü, Tsui-yi is by far the richest agricultural, rice-growing area in the Yung-ning territory.

Continuing on the northern valley slopes we come to the hamlet of A-ka-lo, elevation 8,000 feet. The houses are of mud, the roofs of boards weighted down with rocks. The trail follows the narrowing valley to a bridge near the hamlet of Wa-erh-lo, elevation 7,050 feet. Crossing the bridge over the torrent we continue on the southern slopes in the deep, narrow canyon which Tsui-yi has now become. Mile after mile, the entire stream-bed, rocks, water, etc., is a light green, from immense quantities of algae. The trail winds in and out of lateral canyons, is exceedingly narrow and leads several hundred feet above the roaring green torrent.

The Li-su of Ba-ssu-ko hamlet. — After crossing a lateral valley we ascend the mountain-side to a huge rock shelf or broad terrace, at an elevation of 7,050 feet. Here is the Li-su hamlet of Ba-ssu-ko, known in Na-khi as P'ä-dä. The houses are regular pine log cabins, the roofs of pine boards weighted down with rocks. The latter become superfluous at pumpkin season for the entire pumpkin crop is stored on the roofs of the houses (PLATES 234, 235). The Li-su inhabitants when asked whence they had originally come, replied they did not know, except that they had settled in Ba-ssu-ko for many generations. They do, however, still speak their own language besides Hli-dü and Li-chiang Na-khi, as well as Chinese. Over 30 families dwell in this miserable conglomeration of huts, which look as if they had been dumped on a rock pile.

5: Davies G-5 (1894-1900) 1909 AF16 Southwest China AF16

825 sucks animals down as they cross. Our mules were fortunate enough to get across without encountering this monster. It is perhaps hardly worth any naturalist's while to come out to investigate this strange animal. A Chinaman likes to have a story to account for anything that takes place. In the spring and early summer there would be a good deal of melted snow in the water of the river, while the climate of the valley would be extremely hot and close. The sudden change from hot air into cold water might well produce cramp.

[241] The next day, a good up-hill road brought us to P'u-p'iao, a little plain covered with villages and well cultivated with the winter crops—beans, wheat, and opium. On this march there is an alternative road to Yung-ch'ang, branching off from the village of Fang-ma-ch'ang; it is said to be shorter but more hilly than the main road which I took. Gill travelled by it, but Baber and most other travellers have come by the same road as myself. Baber mentions that he heard that the stream which runs through the P'u-p'iao plain falls into a lake, but the answers to all my enquiries were that it joins the Salween. On the Chinese map there is a small lake marked a few miles lower down, but it is shown as the source of a small tributary of the main stream.

Our road on the 21st rose to the top of a bare range at 7000 feet, and a little beyond this the Yung-ch'ang plain came in sight. The path descends to the plain at the village of A-shih-wo, just before reaching which a cave is passed in the hillside to the left which is said to go right through the hill and come out on the other side.

361 The plain of Yung-ch'ang Fu is about 18 miles long
•312 and six miles wide, covered with villages and well cultivated; it is one of the largest and richest in the province. As in many other plains there is a summer crop of rice, and after the rice has been harvested in the autumn, the winter crops of beans, opium or wheat are put in. A good-sized stream running from north to south irrigates a great part of the plain, and water for this purpose is also collected in reservoirs where some of the side streams run down from the hills.

485 I put up at an inn in the middle of the town. The

5: Davies G-5 (1894-1900) 1909 AF16 Southwest China AF16

000 On the 3rd we crossed another bare range into the Yün-nan Hsien plain. The road leaves the town a mile to the left, so we did not enter it, but passed the night at the village of Kou-ts'un-p'u. Yün-nan Hsien is a place of very small importance, and must not be confused with Yün-nan Fu, the capital of the province. The names of these places are identical, and as Yün-nan Fu is almost always spoken of as Yün-nan Sên[1], the two places are very likely to be mixed up by those not accustomed to the fine differences of sound of the Chinese language.

The next morning some heavy rain fell and the hills to the west were for a few hours white with snow. We had an almost level march through a plateau country among very low hills and small strips of cultivated land till we reached the Yün-nan-yi plain and, passing through the village of that name, put up in the top storey of a very large temple at Mu-pang-p'u.

We had the day before heard news of two foreign officials passing through Yün-nan Hsien. They were described as "one white and the other black," so we had little difficulty in recognising in this description Watts-Jones and his cook, who, being a Goa Portuguese, wore European clothes of sorts. By sending on a man with a letter we managed to catch him at the Ma-kai coal mine, which he had turned off the main road to look at, and the day after our arrival at Mu-pang-p'u he turned up.

These meetings in out-of-the-way places are always very pleasant, and we had much to talk about. Watts-Jones had found a practicable but difficult line for the railway to take. He had also with Ryder been up north to look for a line to the Upper Yangtze, and to examine the resources of the country north of Ta-li. They had reached Li-chiang Fu, which is the threshold of the Tibetan country of north-western Yün-nan, and from there, taking different routes, had turned southwards again, intending to meet at Ch'u-hsiung Fu. The country between Ta-li and Li-chiang they were delighted with. It is a region of lakes and fertile plains, and is agriculturally the richest part of Yün-nan.

●312 The plains of Yün-nan Hsien and Yün-nan-yi which we

[1] *Shêng* (pronounced *séng* or *sên* in Yün-nan) means a province, and is applied also to the capital of the province.

5: Davies G-5 (1894-1900) 1909 AF16 Southwest China AF16

312 had been passing through are, as far as I could see, entirely watered by lakes and ponds: there do not appear to be any running streams. They are much less fertile than the valleys further west, no doubt in consequence of the increased difficulty of irrigating the land where no running water is available.

136 What these plains lack in fertility is from the sportsman's point of view abundantly made up for by the quantities of geese and duck which one finds in the lakes. There were flocks of bar-headed geese all over the plain, and one could walk right up to within twenty or thirty yards of them before they would rise in a leisurely manner. Out of one flock I got six. Two fell to my first two barrels as they rose, and then the flock after flying round a short distance twice, again came over my head at close range, enabling me to get two more each time. This will seem incredible to those who know that very wary bird the wild goose, but I remember in India once, in the Aligarh district, finding a flock of these bar-headed geese equally tame. There was no sport in this, so when I had killed fifteen—enough to feast our followers for two or three days—I gave up shooting them.

However tame the geese may have been, the duck, though numerous, were by no means easy to get within shot of. The mallard and teal seem to be the commonest on the large lakes, and that small black and white duck called the tufted pochard on the smaller ponds.

From Mu-pang-p'u to Chên-nan Chou we took four days, moving very slowly, as Watts-Jones often had to leave the road and ascend hills so as to get a better view of the country. Our road led us at an average height of 7000 feet through a sandstone plateau country, with small hills rising up out of it, very dry and bare except for a few 241 little fir trees. Villages are not numerous, and the cultivation is chiefly confined to strips of beans, opium, and wheat along the narrow valleys.

000 Just before reaching Chên-nan Chou we had made a halt to put up the plane table, when Ryder suddenly appeared coming in by a road from the north. So after being separated for three and a half months we hit each other off to a yard. He had gone from Li-chiang eastward

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had adopted as most likely to afford the easiest line for a railway, so that it was by this route that we set out to meet him.

As far as Ch'ü-ching there are two alternative roads, so Watts-Jones, leaving on the 30th March, took the main road through Ma-lung Chou, while I, starting four days later, went by a somewhat less frequented route through Yi-liang Hsien and Lu-liang Chou.

Ryder had so far failed to get the longitude of Yün-nan Fu from Bhamo, owing partly to the difficulty of getting a strong enough current over this distance of 500 miles of telegraph wire, and partly to the frequent occurrence of breaks, and to the general neglect of duty by the telegraph clerks, under the slack administration of the stout Manchu gentleman who presided over this department[1].

Ryder therefore decided to stay on in hopes of fixing this most important point. As it turned out, he waited there a month and had then to give it up as a bad job. However we were luckily able to get satisfactory observations in the following year.

On the 3rd of April I was able to get away and started off across the Yün-nan Fu plain. Several things here strike the traveller arriving from the west as new and peculiar. The rows of cypress trees along the irrigation embankments are one of the most conspicuous features of this part of the country; and the curious wheels which, worked by hand, draw the water up from the lakes and ponds into the irrigation channels, are not found in the plains of western Yün-nan, where nearly all the water is running. It is true indeed that these wheels are used in Yün-nan Hsien and other places west of the capital, but I have never seen them west of Ta-li.

But what struck me as most extraordinary was the use of carts. These I certainly did not expect to see in western China. I subsequently found them in use in nearly all the plains of eastern Yün-nan. They are very small and are drawn by one bullock or buffalo. They are only used for

[1] Mr Jensen was in no way responsible for the frequent breaks which occur in the Yün-nan telegraphs. His work was to keep the electrical instruments in order. The upkeep of the actual telegraph wire is in the hands of Chinese, who make as much money out of it as they can.

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186 friends instantly dispersed in different directions. However one of them was a slow mover, and we soon caught him and gave him a good thrashing. This, however, turned out not to be the man who had actually shouted, though I have no doubt his licking did him a lot of good. So we set to work to search for the real culprit, and soon found him hiding in a wet nullah. After a short interview, we left him begging for mercy, covered with mud and water, with a bleeding nose and various bruises all over him, so perhaps he will be more civil in the future.

This expression, *yang kuei-tzŭ*, has come to be the usual name for a European among the Chinese, and I have heard it used by ignorant countrymen in out-of-the-way places, evidently without realising that there was anything insulting in it; but when shouted out in this way as one passes, it can only be meant as an insult, which it is one's duty to resent.

361 On the second day out from Hsüan-wei we passed through the large village of T'ang-t'ang, lying in a narrow valley shut in by steep hills. This is the headquarters of the lessee of the copper mines in this neighbourhood. [316] They get copper in many places near here, but they say the mines do not produce as much as they used to. We slept at Hsin-t'ien-p'u, at 7,250 feet. In the afternoon there was a heavy thunderstorm, which left a little patch of snow on one of the ranges.

On the 18th April after a long ascent we went downhill, very steeply, to the K'o-tu Ho, a river 20 yards wide, running with a rapid current over a rocky bed. In the dry season it is fordable, but later on in the year, when the rains are heavy, it gets very deep and is crossed by a ferry-boat, fastened to a wire rope which is stretched across the stream.

131 This river forms the longest source of the West River of Canton. It here marks the boundary between the provinces of Yün-nan and Kuei-chou[1], so that at Chan-p'o, 312 where we slept, we were in the latter province. The hills of this part of the country are very dry, and the villagers

[1] To be exactly accurate, there is a narrow strip of land on the left bank of the river which belongs to Yün-nan.

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here asked us to show them where to dig for water. The Chinese often credited us with the power of seeing what is under the earth. I suppose the idea is derived from embroidered narratives of the exploits of mining engineers.

The next march, over a dry, hilly country, brought us to Yao-chan, where we halted for a day as Watts-Jones had to go up a hill to the east to get a better idea of the lie of the country. I took the opportunity to go up another hill to the west to do some surveying, and to visit a copper mine about two miles off.

This mine, they say, was formerly very productive and 2000 men are said to have found employment here. At the time of my visit there were not more than 100 miners at work. They live in little huts scattered about the valley, and there are three furnaces constantly kept burning to smelt the ore they dig out. The ore is mined out of the solid rock of which the hill is formed. There are no deep shafts: they cut caves out of the hillside, and the miners often live in the caves they are working in. They use hammers and iron wedges, and they say a man can get out a mule load of ore in two days. The ore varies a good deal in quality, and is sold for from two to seven mace a mule load. Taking a load as 130 lbs., this comes to from sixpence to one and ninepence for 100 lbs. The best ore is of a purple colour and is said to produce 10 per cent. of copper.

The lessee of the mine pays 500 or 600 taels a year to the Government for the right of smelting, and the miners are obliged to sell the ore to the lessee. The copper produced is sent to Kuei-yang Fu, the capital of Kuei-chou province, and is there used for coining into cash.

The hill-tops in this part of the country rise to about 8000 feet, and they all had snow on them, which, combined with a biting north wind, made this one of the coldest days I have ever felt in western China.

On the 21st April we crossed a range, and skirting the edge of a large lake reached Wei-ning Chou, which is built on its further shore. The walls enclose a large space, but it is chiefly filled with temples, including a very large red Confucian temple. There are not more than 600 houses in the place, half within the walls and half without.

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000 streets and crowded the house-tops to get a look at us. Work must have been entirely at a standstill for that afternoon. The crowd was however a very civil and friendly one. On arriving at the inn I found the enterprising landlord had arranged some reserved seats for his family and friends, so that they might watch whatever I did in my room. This was a little too much, and I was obliged to intimate that the performance was finished for the day.

361 The town of Hsin-p'ing is in two parts, one surrounded by a stone wall, the other by a mud wall. The officials
563 live in the former, but all the shops are in the latter. The people are chiefly Chinese, but there are a few Lo-los in almost every village and even in the town. Doubtless it was a Lo-lo country originally, and many of the Chinese are of Lo-lo descent.

241 The plain is most of it on a slope and somewhat cut up by stony, uncultivated ground, but it appears to grow fairly good crops. Its height is over 5000 feet, and it is cool enough to grow opium and warm enough to grow sugar-cane, two crops that I have never elsewhere seen side by side. I bought here the best oranges that I have ever tasted in any country.

•312 Our next three days' march lay through a poor country,
316 without much water in it that can be used for irrigation. The streams are most of them little trickles over a bed of solid rock, with occasional muddy pools. On the third day we reached Ssŭ-ch'êng, a village at 6000 feet, which has the remains of a mud wall round it. On this last march we passed a small iron mine at a place called Chia-tso. It is only worked on quite a small scale and does not appear to be very productive. Most of the ore is smelted near the mine, where they have enough to keep one small furnace going.

361 From Ssŭ-ch'êng, crossing two more ranges, we arrived at Yi-mên-Hsien on the 17th January. It is a very small place, the town walls built round a little hill which stands out in the middle of the plain. But inside the walls are only about 50 houses, two large temples, and the mandarin's yamen. Nearly all the population live in a suburb to the south of the real town. The plain is five miles long and is well cultivated.

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166 the neighboring provinces of interior China. The influx of these heterogeneous groups of immigrants brought with it many ideas and practices to help in the adjustment of the people to their new environment, particularly in connection with agricultural and forestry land use. This fact helps to explain the present heterogeneity of the agricultural landscape of the Basin.

463 439 Agriculture and forestry are the outstanding features of the economy of the Szechuan Basin. Approximately 85 per cent of the people gain their livelihood from agricultural pursuits. In terms of exports from the Basin, however, the leading item, Tung oil, is a forest product. Most of the other exports are either agricultural or forestry products.

241 •312 In so far as agricultural land use is concerned, nowhere else in China except in Szechuan Basin does one find terraced fields so extensively, elaborately, and finely made, and irrigation systems so greatly diversified and ingeniously devised. The Basin is almost literally a country of "millions of minute steps" and a land of "thousands of small ditches." The terraced fields and the irrigation ditches, together with the hard-working peasantry have helped to transform the otherwise hostile rugged Szechuan Basin into a smiling garden.

Other unique features of the Basin's agricultural land use include the age-old but the recently much publicized Tung Shui Tien (winter storage water field) system; the cultivation of Tsai Seng Tao (double-growth) variety rice; the numerous special methods of soil culture, fertilization, composting, and crop rotations; and the various elaborate systems of inter-culture and synchronization of crops.

133 As has been implied, the Basin is a natural unit. Its combination of surface, climate, soil, and drainage is unlike that of any other part of China. In large measure, the interior of the Basin within the mountainous border is made up of hill country which varies from hilly areas of low relief in the south to the fairly high parallel anticlinal ridges in the east and to a border of complex hills at the north. Near the western edge of the Basin, the hills give way to the Chengtu Plain, a broad piedmont alluvial plain, the most productive part of the Basin.

132 Climatically, the Basin has a phase of the "humid subtropical" type of climate.[1] The Basin extends from latitude 28

[1] G. Trewartha, An Introduction to Weather and Climate, Plate I, 1937.

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134 brown" type soil is rich in mineral foods but rather low in humus content and is shallower in depths than the soils of the Chengtu Plain. However, on account of the hilly nature of most parts of the Basin, soil characteristics vary greatly in different local areas.

311 241 In many ways, the distribution of agriculture and forestry and the features associated with these uses of the land are related to and conditioned by one or more of the natural elements characterized in the foregoing paragraphs. Forests mantle the [131] mountain slope, and tree crops are characteristic of many of the hillsides. Agriculture dominates the Chengtu Plain, and is conspicuous along the numerous valley floors and on the terraced hills.

133 311 Of all the natural elements at work in the Basin, topography is a highly important factor that affects the agriculture land use and other forms of cultural life, and the adjustment to this natural element is especially conspicuous. First of all, the close correlation between the cultivated-land index and the topography is most striking. In general, there is a consistent tendency for the cultivated-land index, and the population patterns as well, to decrease from the center of the Basin to the peripheral highlands. Second, the adjustment of the Basin's settlement forms to the topography is outstanding. As in most parts 361 of China, about 85 per cent of the population of Szechuan Basin is rural. But unlike any other part of China, there are comparatively few large villages and nuclear hamlets, with the exception of the Hsien[1] capitals. This remarkable fact is largely a result of the rugged and extremely dissected topography of the Basin. The settlement forms have had to adjust to the local topography. This is particularly true in the eastern and northern parts of the Basin.

312 In the agricultural adjustment to water resources and drainage patterns, the following examples may be noted. First, by seizing the torrential flow of the Min River, the Basin has built not only the oldest but also the most successful and easily-maintained irrigation system of all China. This system has freed the Chengtu Plain from the hazard of floods and droughts, and has insured the unbroken agricultural prosperity of the Basin. This

[1]Hsien or district in China corresponds somewhat to the county unit of the United States.

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success is evidenced by the remarkable fact that during the past twenty-two hundred years, ever since this irrigation work was built, there have been only six minor floods in the Plain. 312

The presence of innumerable other irrigation projects, greatly diversified in construction and surprisingly adaptable to the local topography and source of water supply, bears witness to the painstaking and extensive adjustments the Basin has made to the vital problem of water supply.

A second adjustment to water resource lies in the fact that even with its limited available technological knowledge, the Basin has made good use of many of its numerous streams. By canalization, damming, and other devices, the navigability of these streams has been greatly increased. Especially the successful negotiation by steamboats of the bottle-neck (gorges) of the mighty Yangtse has greatly tempered the continental position and the land-locked character of the Basin. These achievements, in turn, have facilitated the movement of the bulky agricultural and forestry products among the various areas both within and without the Basin.

The localization of the Basin's urban units on the terraces and along the banks of the principal rivers is a third example of adjustment, partly to topography and partly to river transportation. 361

Among the climatic adjustments, the architecture of the Basin (characterized by the projecting eaves, recurved roofs, and elaborate roof ornaments) is closely correlated to the absence of wind and snow and the extended misty rain-season of the Basin. 132 341

The practice of digging in the soft, friable, cretaceous bed rock, in order to hasten weathering and soil formation for agricultural land use, represents one of the most astounding examples of soil culture and environmental adjustment in the Basin. 242

As a result of the abundant growth of bamboo in the Basin, an interesting adjustment to vegetation has taken place. Nowhere else in China except in the Basin does one find widespread use of bamboo. In addition to the large number of articles of furniture, household tools, and utensils of various kinds which are made from this material, even the great engineering construction works, including the important irrigation systems, bridges, and brine-salt mining equipment are all made of bamboo. It was once estimated that bamboo is used for six hundred different purposes in the Basin. Here people are truly in the "bamboo age." 314

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4. Agricultural Land-Use and Water Resources

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a) Importance of irrigation in the Basin.--A prominent German authority on the agrarian economy of China once pointedly remarked: "Everywhere in China irrigation is an indispensable condition for the intensive agriculture on which Chinese agrarian society is based, just as coal and iron are an indispensable condition to the industrial society on which modern capitalism is based."[1] This statement is particularly applicable to the situation in Szechuan Basin. Here, in spite of the moderate rainfall and low evaporation, the need for irrigation is essential for the success of many crops, especially rice.

b) Principal methods of irrigation in the Basin.--There are many different kinds of irrigation practices in the Basin. Each of these methods is equipped with a different device, and is adjusted to local topography and to the local source of water supply. Generally speaking, the methods may be classified under five main groups:

(1) Grade or gravity irrigation.--This practice involves the division and diversion of the upper reaches of a river of comparatively moderate grade into small branches. Such branches are led, by the force of gravity, into valley fields at a lower level and then arranged so that they drain back into the main river farther down stream. This method is practiced in nearly every part of the Basin where a valley plain can be found, since the grade of most streams here is appreciable. The method is particularly widely practiced in the areas along the lower Min River, between the Peng-shan and Lo-shan districts.

(2) Wind-wheel irrigation.--In areas where rivers have deeply eroded channels, frequently as deep as 30 to 40 feet below the surrounding land in the soft sandstones, and where the grade is great, the swift-flowing streams are utilized to lift the water for irrigation use by bamboo water-wheels. These undershot irrigation water-wheels, with delicate structures of bamboo buckets on their periphery, can raise water into a flume from 30 to 75 feet above the level of the stream (Fig. 27). They are particularly popular in the Tung-chuan and Tze-liu-ching areas of the Lower To River Valley.

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[1] K. A. Wittfogel, Wirtschaft und Gesselschaft Chinas; versuch der Wissenschaftlichen analyse einer grossen asiatichen agragesselschaft (1931), p. 229.

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(3) The "Lung-ku-chiao" or "dragon-bone-chariot" irrigation method.--In areas where the water flow is not sufficient to turn water-wheels, the old "dragon-bone-chariot," or the foot-power water elevator, which is found in many other parts of China, is used. It is a long, narrow wooden trough affair, open at both ends, with one end submerged in the water, and equipped with a chain of wooden pedals. It is a sort of step-up device, like a western escalator, operated by the foot-power of usually two or more persons. The water is lifted from one field to another of higher level. This device is also commonly used in hilly areas to lift water between terraced rice fields. It is particularly popular in the Kuang-hang and Te-yang districts.

(4) Storing-water-field or reservoir field irrigation.--As already explained, throughout the hilly areas of the Basin, it is a common practice to store water in fields during the winter season for spring or summer crops. As rainfall in the Basin is highly seasonal, some reservoir for the run-off from the immediately adjacent hills is necessary. Certain fields, in hollows well up the sides of slopes of terraced lands, are set aside as reservoirs. They are kept as nearly full as possible to tide the farmers over the periods between rains and between crops. This method, of course, necessitates the husbanding of all the rain water and run-off during the fall season in order to lead them into these field reservoirs.

(5) Ditch or canal irrigation.--This method involves the tapping of a stream at its upper reaches and then branching it into multitudes of anatomized channels and ditches for irrigation purposes. This system is by far the most important in the Basin. It is practiced in a number of river deltas, such as the To, the Fou, and the Min. The outstanding example is the Tu-chiang-yen works (Fig. 28) on the Min River in Chengtu Plain. A detailed discussion of this great work and its significance to the agricultural land-use of the Basin will be made later in connection with the agricultural area of Chengtu Plain.

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D. Principal Agricultural Areas of Szechuan Basin

On the basis of crop association, relative prosperity of agricultural production, general appearance of agricultural landscape, use of water for agricultural purposes, and the degree of commercialization of agricultural production, the Basin may be

China, with the possible exception of the Lower Yangtse Delta region, is the average population density so high. It is, of course, made possible only by the tremendous productivity and the intensity of agricultural land-use in the Plain. 162

h) Irrigation works of Chengtu Plain--Tu Chiang Yen as the nerve center.--The Tu-chiang-yen irrigation works, built 2,200 years ago, when applied science was yet unknown in Europe, is one of China's best known ancient engineering feats, and is one of the two oldest irrigation works in all China. It is this system which is largely responsible for the fertility of Chengtu Plain, commonly known in Chinese history as the "Heavenly country." It is also because of this system that this "Heavenly country" has experienced only 17 minor droughts and floods in the last twenty-two centuries. 3120

(1) Historical development.--The Tu-chiang-yen system was devised to harness the waters of the mighty Min[1] on their way down from the Tibetan Plateau in order to irrigate the farm-lands in 14 districts of western Szechuan Basin. According to Shih-Chi, in the earliest Chinese historical Annals,[2] the system was first constructed by General Li Ping and his son, in 316 B.C., immediately after the conquest of Szechuan (then the Shu State) by the feudal Chin State (Shensi). The annals read: "In Shu (Szechuan), the governor cut a canal through Chengtu to connect the navigable rivers in the region into one system."[3]

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[1]We owe to the Ming explorer and geographer, Hsu Hsia Ke (1586-1641) the first appreciation of the actual relationship between the present Yangtse and its tributaries, as understood today. It is interesting to note that prior to his clarification, the Chinese for centuries, regarded the Min, because of its huge volume and torrential flow, as the upper stream of the Yangtse itself. It was not until Hsu Hsia Ke, who first ascended the Yangtse, that it became an established fact that the Ching Sha River was the upstream of the Yangtse itself. This was about one century earlier than the Jesuit Fathers who first compiled the Celebrated Atlas of Imperial China (cf. V. K. Ting, "Hsu Hsia Ke, Explorer and Geographer," New China Review, III [1921], 336-37).

[2]Ssu Ma Chien, Historical Annals, Vol. XXIX, Books on Rivers and Canals, p. 2.

[3]During recent years, a number of students of the subject have refused to accept the fact that Li Ping was the builder of the system, and have asserted that a man named Pieh Ning or Kai King (a minister of the Shu State) initiated these irrigation works, several hundred years before Li Ping. They contend that Li Ping only extended the system and improved it, but did not

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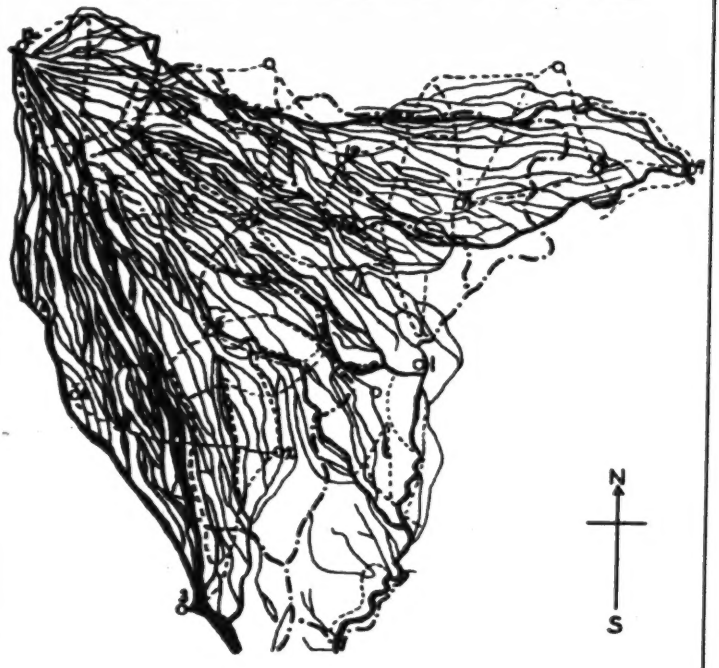
FIGURE 30

PRINCIPAL IRRIGATION CHANNELS CHENGTU PLAIN

1. Chengtu
2. Shuan-liu
3. Sin-tsing
4. Tsung-ching
5. Wen-chiang
6. Pi-hsien
7. Sin-tu
8. Ching-tang
9. Chao-chia-tu
10. Sing-fang
11. Tsung-nin
12. Kuan-hsien



LEGEND

- o DISTRICT CAPITAL
- DISTRICT BOUNDARIES
- IRRIGATION CHANNELS
- ROADS

0 10 MILE

0 10 KILOMETER

C.Y.H.

Data from the Bureau of Reconstruction, Szechuan

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(2) Layout and extensions.---The whole Tu-chiang-yen system, with its pivotal point at Kuan-hsien where the torrent of the Min first enters the Plain, is roughly triangular in shape (Fig. 30). With Kuan-hsien as the apex, and the line from Chengtu to Sin-tsin as the base of the triangle, the system covers an area of 3,500 square kilometers, or 5,200,000 mow, which is much smaller than the total area of Chengtu Plain. It includes altogether fourteen districts, namely, Kuan-hsien, Pi-hsien, Peng-hsien, Tsungning, Sin-fang, Kwang-hang, Chin-tang, Chengtu, Sin-tu, Wen-chiang, Hua-yang, Tsung-ching, Shuan-liu, and Sin-tsin (Figs. 30 and 37). From Kuan-hsien to Sin-tsin and Chengtu, the drop is rather gradual and uniform, averaging about seven to eight meters per kilometers, a grade of hardly half a degree, or less than one per cent[1] (Fig. 5). This moderate and even slope has proved to be very favorable for building irrigation channels.

The system is divided by Tu-chiang ("Fish Mouth")[2] breakwater, an inverted V-shaped dike (Fig. 31). At Kuan-hsien, the river is divided into two main channels, the Nei-chiang (inner river) and Wai-chiang (outer river). The Wai-chiang is the main channel of the Min River. It is further divided into five channels, which are, from west to east, the Sha Kou, Hei Shih, Cheng Nai, Chiang An, and Ching Ma streams (Fig. 30). All these channels, with the exception of the last, flow nearly due south. Together with their more than 158 subdivided canals,[3] they carry water to farms in the seven districts of Kuan-hsien, Pi-hsien, Wen-chiang, Shuan-liu, Hua-yang, Tsung-ching, and Sin-tsin. Finally, all these channels of the Wai-chiang join at Chiang-ko, about forty-five miles south of the city of Cheng-tu.

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initiate it. This view, however, is not widely accepted in China (cf. Chang Chu's work entitled "Shu Chih" [the Gazeteers of Shu State], a work of Chin dynasty [265-419 A.D.] and a series of articles by J. Vale, "Irrigation Works of Chengtu Plain," Journal of North China. Branch of the Royal Asiatic Society, XXXIII (1900), 105-19, and XXXVI (1905), 36-50.

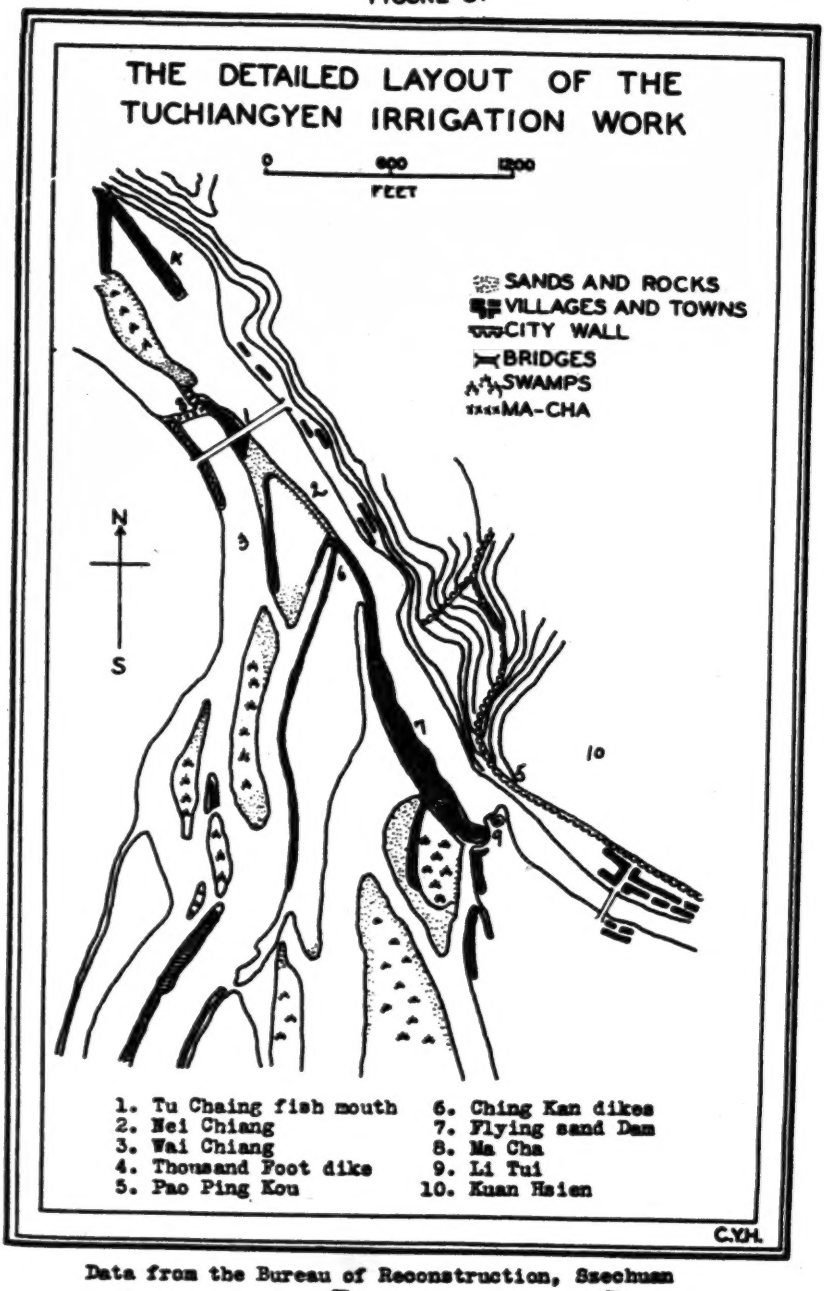
[1]Bureau of Reconstruction, Szechuan Provincial Government, A Report of the Tu Chiang Yen Irrigation Works (1933).

[2]Ibid., p. 28.

[3]S. F. Swen, "The Engineering Works of the Tu Chiang Yen Irrigation Project," Topographical Magazine, VII, No. 6 (1931), 18-27.

FIGURE 31

312



Data from the Bureau of Reconstruction, Szechuan

[Face p. 65]

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The Nei-chiang is divided into three channels, which are, in the south to north order, the Chou Ma, Pai Tiao, and Pu-yang streams (Fig. 30). The most southerly one, the Chou Ma stream, flows nearly due east and irrigates the districts of Pi-hsien and Cheng-tu. The central one, the Pai Tiao stream, flows northeast, and irrigates the western and northern parts of the above-named districts. Branches of these two streams flow past the south and north walls of Chengtu city, uniting near the east gate of the city. The northern-most channel, the Pu Yang stream, flows towards Peng-hsien, and then southeastward past the Kwang-hang district. At Chao-chiao-tu of Ching-tang (Fig. 30), the Pu Yang stream, together with numerous anatomizing canals, forms the headwaters of the To River and flows due south past the famous salt well areas of Tzu-liu-ching, and finally enters the Yangtse at Lu-hsien (Fig. 7). These three main channels of the Nei-chiang are further divided into more than 130 canals,[1] which are used to irrigate farms in eleven districts of Kuan-hsien, Tsung-ning, Peng-hsien, Sin-tu, Sin-fang, Ching-tang, Kwang-hang, Cheng-tu, Pi-hsien, and Hua-yang.

The natural tendency is for the Wai-chiang to get more of the flow, while the Nei-chiang gets less. But the human effort has been to reverse this tendency, so that more water may be available for irrigation purposes in the Nei-chiang. At present, the ratio of the flow is about 60 per cent to the Nei-chiang and only 40 per cent to the Wai-chiang.[2]

The nerve center of the Tu Chiang Yen Irrigation Works, from the Pai Chang Ti, the "Thousand Foot Dike," at the north, down to Pao Ping Ko Cliff at the south (Fig. 31), extends for a total length of approximately 4 li. The "Thousand Foot Dike," at the northern-most end of the works, was built of heavy gravel stones and rocks (taken from local hills), to direct the current to the Tu Chiang Yen "Fish Mouth" below it. Behind this dike, a 500-meter bamboo suspension bridge, the "An-Lang-Chiao," or the "Pacifying Wave bridge," spans the river. Under the bridge is the Tu Chiang Yen "Fish Mouth" breakwater, which, as already mentioned, serves as the pivotal point (in an inverted V-shape) at

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[1] Ibid., p. 21.

[2] T. N. Pao, "The Irrigation Works of Chengtu Plain," Nankai University Publication (1938), p. 36.

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312 which the flow of the main river is split into two principal channels, the Wai-chiang (the outer river) and the Nei-chiang (the inner river) (Fig. 30). This breakwater was originally built of rocks, protected by baskets of egg-shaped gravels, but was rebuilt in 1935 of rock and reinforced concrete.

Besides the "Fish Mouth" breakwater, there are two long dikes, known as the Ching-Kan-Ti (Indestructible Buddha Dikes), made of large stones, to control the direction of the flow (Fig. 31). Two additional dikes, the Fei Sha Yen, made of baskets of gravels, serve as overflow dams to divert excess water in the spring from the inner river to the outer river, and to redivert it in the dry season from the outer river to the inner river.[1]

The entire system requires annual repairs and dredging, and a thorough dredging every five years, besides occasional emergency repairs. The annual dredging takes place in winter when the river is low. A dam is constructed across the mouth of the outer river. Water is prevented from rushing into this channel by means of baskets of stones held together by wooden tripods and protected by reeds and clay (Fig. 32). After the outer river has been dredged and repaired, a similar dam is erected across the mouth of the inner river. Known locally as "Ma-Cha," these tripods are eight to ten meters high, and are made of local materials. From 40 to 50 such tripods are needed to stop the flow of the outer river, and 60 to 70 tripods are required for the inner river.[2] At the beginning of April, when all repair and dredging work is completed, the dam is opened simply by cutting the tripods and removing the reeds.

At the foot of the western wall of Kuan-hsien city, in the southern extension of the Tu Chiang Yen Works, Li Ping cut a channel through the rocky Litui hills (Fig. 31). This channel, known as Pao Ping Ko, the "precious bottle-neck," which it indeed is, serves as an outflow for the Nei-chiang channels, and is another key point of the whole Tu Chiang Yen Works. It holds the fierce rush for an instant and deflects it at a sharp angle to the north. Water marks are cut on the Pao Ping Ko Cliff. And in the bottom of the river a little above the Cliff, there is an iron

[1]Bureau of Reconstruction, Szechuan Provincial Government, Tu Chiang Yen Irrigation Works (1933), p. 26.

[2]C. S. Mao, Irrigation Works of Chengtu Plain (1934), p. 18.

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bar to indicate the depth of dredging required each year. 312

Aside from being noted for the virtue of being easily-built and easily-maintained, the original construction of the Tu Chiang Yen Irrigation Works has the special merit of making use of the local cheap raw materials, such as bamboo and rocks, for its entire construction. Besides the "Ma-Cha" tripods, Tu Chiang Yen calls for the use of local materials in the construction of gravel basket containers which are also necessary for the irrigation works. A special "white shell bamboo" produced in the hills about 50 kilometers west of Kuan-hsien and famous for its strength, is used for these containers. The "white shell bamboo" groves are not allowed to be cut for any other purpose. The bamboo is rafted to Kuan-hsien and made into baskets 30 feet long and 1.7 feet in diameter, weighing 100 catties.[1] Filled with gravel, they are placed at the outer sides of the dikes and dams to protect them against rapid currents. These baskets hold together easily and stay intact in spite of the wash. They have proved their special effectiveness for hundreds of years. They have been used ever since the Wan Li period of the Ming dynasty.[2]

In the excellent upkeep of these age-old irrigation works, which have been operating successfully for thousands of years, the engineers have all followed faithfully a few terse instructions enunciated by the original builder. These are: "Shen Tao Tan, Ti Tso Yen, Yu Wan Chieh Chih, Feng Chen Chou Hsin," literally meaning "Keep the dikes low, dig the channel deep; straighten out the curves, gouge out the center." These words, now carved in big letters (Fig. 33) on a monument at the Shrine for Li Ping and his son, echo the wisdom of this great hydraulic engineer.

The long success of this unique irrigation project is known throughout China, and has often been lauded by Chinese writers. But it was F. von Richtofen, the eminent German geographer, who first publicized its excellence to the western world.[3]

The works are now managed by the Tu Chiang Yen Construction Engineering Administration of the Szechuan Provincial Reconstruction Bureau. Besides directing the annual dredging and

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[1] Tu Chiang Yen Irrigation Works, op. cit., p. 41.

[2] Fan Tsan Yang, et al., Szechuan Tung Chih (Gazetteers of Szechuan Province), Chuan 146, p. 8.

[3] Richtofen, op. cit., pp. 228-34.

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312 repairs, this Administration has also introduced numerous modern technological improvements in order to increase the durability and effectiveness of the project.

Recently, a hydrographic station has been established at the Erh Wang Shrine by the Administration to study the flow of the Min River. Projects are under way to harness the river's maximum flow of 9,500 cubic meters per second[1] to generate electricity for the Chengtu Plain. Two small hydro-electric plants are in operation at Chengtu and Ching-tang.[2] The Administration is contemplating building a 12,650 kilowatt power plant at Kuan-hsien. A 23-kilometer canal will be cut to link the Inner and Outer rivers between Wen-chiang and Chengtu to maintain the Chengtu city water-supply and navigation between the two rivers. The Administration also has plans for the dredging of the existing canals and the digging of new ones to control more effectively the flow in both rivers, and to repair the tributary creeks to increase by another 600,000 mow the farms irrigated by the system, and eventually bring the entire Chengtu Plain under irrigation.

Among all the geographic features of Szechuan Basin, the Tu Chiang Yen Irrigation Works holds the key to the sustained prosperity of the agricultural land-use of the Basin, particularly of Chengtu Plain. Indeed, it commands the special attention of all geographers.

2. The Specialized "Commercial" Agricultural Area of Lower To-Fou Valleys

241 433 Comparing to the General Grain Farming area of Chengtu Plain, this agricultural area of Lower To-Fou valleys (Fig. 24) is noted by its specialized "commercial" products, such as sugar-cane, cotton, mulberry trees, and citrus fruits. About 85 per cent of the Basin's total production of sugar-cane, 65 per cent

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[1] Pao, op. cit., p. 48.

[2] According to the recent (1935) survey by Huang Hui, a prominent hydraulic engineer of the National Reconstruction Commission, it is highly feasible to develop multiple purpose water-power projects in the upper reaches of the Min, where the present source of irrigation water originates. These projects, if established, would also benefit the irrigation works, particularly by lightening the annual dredging work and reducing the operation costs (cf. section on "Potential Water-Power Development of Szechuan," Report of Chinese Engineer's Association Investigation of Szechuan (1936).

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5. The Mixed Farming Area of the Southwestern Basin

Among all the principal agricultural regions of the Basin, the mixed farming area of the southwestern Basin (Fig. 24) is the most interesting. Here lies an area like a synthesis of all the above four areas. Besides its own unique quality, as we shall see shortly, this area possesses some characteristics of each and every one of the above four agricultural areas. This condition is true in topography, soil, crop association, and other aspects.

In topography, for instance, this area possesses some of the anticlinal ridges (but lesser in magnitude) like the eastern Basin; some irregular hills like the northern Basin; and some broad plains (in smaller extensions) like the Chengtu Plain, or rather, like the lower To-Fou valleys. However, unlike all the above four agricultural areas, the absolute relief here is, on the whole, the lowest, averaging about 300 meters above sea level.

In soil, this area is also a miniature model of the above four agricultural areas. The usual purple-brown soils of the northern Basin, the limestone soils (old and young yellow earths) of the eastern Basin, and the rich alluvial soils of the Chengtu Plain and To-Fou valleys are all present here (Fig. 9).

In agricultural land-use and crop association this area has the greatest variety of products. The broad river valleys of the Min (lower) and Yangtse furnish fertile fields for rice, sugar-cane, and orange groves. The more hilly lands, terraced in minute steps, are used for corn, wheat, rape, hemp, barley, potato, beans, and other crops. Unlike the other four areas, corn is the most predominant crop here. Moreover, on the steep slopes of the high anticlines, or on other more hilly areas, numerous forestry products, such as tung tree, tea, white wax, mulberry trees, and various kinds of bamboo, are found. Especially, the bamboo products and white wax are the most famous.

Above all, another interesting feature of this area is the bona fide tropical character of its agricultural and horticultural products here. Climatically, with the exception of the southeastern highlands of the Basin, this area is the warmest among all the agricultural areas of the Basin (Fig. 24). Such well known tropical products as Li Chi, Lun yen, bananas, and palm vegetation are found here.

Another special feature of this area is the difference in its water use. Like Chengtu Plain this area is endowed with

312 rich water supply by the Yangtse, the Min, and other rivers. Numerous channels are built here, for instance, such as the Wu Tung-chiao and Chien Wei districts. But contrary to the practice of Chengtu Plain, and for reasons unknown, very few of these channels are used for irrigation purposes. Instead, they are principally for transportation use.

135 Other interesting features of this agricultural area include its well-balanced endowment with mineral resources. Neither like the Chengtu Plain area of western Basin--where little or no mineral deposits are found--nor similar to the anticlinal areas of the eastern Basin--where is located the largest concentration of the Basin's mineral deposits, especially coal and iron--this area is rather well-balanced in various kinds of mineral deposits. In fact, this area is reasonably rich in every one of the strategic minerals, including salt, coal, iron, petroleum, copper, gold, and aluminum. Especially the salt production is the richest and the most important at present (Fig. 20).

241 In agricultural richness and productivity, this agricultural area of southwestern Basin, as a whole, compares favorably
433 with that of the specialized commercial agricultural area of the lower To-Kou valleys. This fact is evidenced by the fine, well-kept farmsteads here (Fig. 34). In terms of population density, this area also stands out as one of the five high densely populated areas of the Basin (Fig. 10).

E. Agricultural Products

241 The Szechuanese commonly claim that anything which is produced on earth may be found in the Basin. At least it is safe to say that there is scarcely an article grown in China which is not produced here in abundance. First of all, the summer field crops include rice, corn, sugar-cane, tobacco, potato, millet, kaoliang, cotton, beans of all kinds, and a great variety of vegetables and fruits. The winter crops include principally wheat, rape, beans, peas, and many others.

1. Common Food Crops

243 a) Rice.--Rice (oryza sativa) is the master crop of the Basin. It normally occupies 43,000,000 mow, or 42 per cent of the